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September 25,  
1963

Colonel Robert J. Burger, USAF  
Secretary  
USAF Scientific Advisory Board  
Washington 25, D. C.

Dear Colonel Burger:

Thank you for your invitation to attend the Fall General Board meeting to be held at Offutt Air Force Base on October 24 and 25. Unfortunately, I now find it will be impossible for me to away from Washington during that week, and therefore must send my regrets.

The agenda looks like a very interesting one, and I know others attending the meeting will find it of benefit.

Sincerely,

*151*

Albert D. Wheelon  
Deputy Director  
(Science & Technology)

DDS&T/jlp:7713

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**A RESUME OF  
THE HISTORY AND MISSION  
OF THE UNITED STATES AIR FORCE  
SCIENTIFIC ADVISORY BOARD**



**1 JANUARY 1963**

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THE HISTORY AND MISSION  
OF THE UNITED STATES AIR FORCE  
SCIENTIFIC ADVISORY BOARD

1 January 1963

The present USAF Scientific Advisory Board had its beginning in 1944 in the environment of the Second World War. At the time, and while there yet remained much more to be done in bringing about a successful culmination of the war, many important lessons had already been learned. Probably the greatest single lesson learned had been the significance of air power, wherein air superiority had emerged as a predominant factor affecting all aspects of warfare. In the minds of those concerned directly and intimately with the total conflict, there existed no doubt as to its outcome and, in turn, the future implications on world affairs arising directly from the use of air power.

Accompanying the recognition of the existing and foreseen importance of air power, other unmistakeable and salient developments had also become evident. Throughout the entire complex of the war there had evolved a clear recognition of the major impact of science and technology. Radar, gas turbine engines for propulsion of aircraft, and embryonic but never-the-less strategically significant airborne and ballistic missiles had appeared and were in operational use. The atomic bomb to be operationally employed several months hence (the development of which was known to key military leaders), was to give even greater credence to the influence of science and technology on the art of war. To a few at least and although quite prematurely, it had already begun to appear as if it might soon be timely to replace the term "the art of warfare" with "push-button warfare."

In assessing events already past in the conduct of the war, and in contemplating those yet to occur leading to its conclusion, it seemed quite obvious to some of the country's military leaders that the United States had directed its effort primarily to production engineering matters and that far too little attention had been given to advanced scientific and technological matters. The realization in foreign countries of radar, gas turbine aircraft engines, the V-1 and the V-2 ballistic missile from among several, provided definite evidence of this. Even the creation of the atomic bomb stemmed largely from the minds of scientists who had in

the main migrated to the United States from foreign countries. It was because of these convictions that General H. H. Arnold, then Commanding General of the Army Air Forces, undertook in an agreement reached with Dr. Theodore von Karman, the formulation of the Army Air Forces Scientific Advisory Group.

The charge given to the Scientific Advisory Group was to examine the spectrum of science for the specific purpose of identifying new scientific ideas and associating promising technological approaches in aid of insuring the future qualitative superiority of American Air power. Under this charge, Dr. von Karman and approximately 35 key scientists, undertook deliberations and developed findings that led to the publishing of a series of documents of great importance. The first of these was a volume entitled "Where We Stand." This was followed by a series of volumes entitled "Toward New Horizons" and subsequently a summary volume was released under the title of "Science-The Key to Air Supremacy." The impact of these documents on the Air Force was far-reaching, and the scientific-technological guidelines included in them markedly set the stage for modern aerospace power now existent in this country.

During its history, the Board has changed considerably in its size, increasing from the original group of 35 members to a peak figure of 180 members and consultants. It is currently composed of 70 members who are disposed within the Board's structure as shown on the attached chart. While the Board has not altered its primary charge of providing scientific-technical advice aimed at insuring aerospace supremacy, it has maintained a flexible posture and has adjusted its approach as required in the solution of critical problems at hand and the development of applicable guidelines for the future. The need for maintaining a continuously modern outlook is a vital quality. In order for this quality to be perpetuated to the proper degree, careful management/operational techniques governing the Board are pursued to insure direct contact with Senior Statesmen type of scientists on its roster, and also the timely integration and use of younger scientists and the new ideas they bring with them.

The current Chairman of the Board is Dr. H. Guyford Stever, who is also Head of the Department of Mechanical Engineering, Massachusetts Institute of Technology. The Vice Chairman of the Board is Professor Courtland D. Perkins, Chairman of the Department of Aeronautical Engineering, Princeton University; and the Military Director of the Board is Lt General James Ferguson, who also occupies the post of Deputy Chief of Staff, Research and Technology on the Air Staff. The original Chairman of the Board, then the Scientific Advisory Group, Dr. Theodore von Karman, was followed by Dr. Mervin J. Kelly of the Bell Telephone Laboratories. Dr. Kelly in turn was succeeded by Mr. James H. Doolittle, who until recently has been Chairman of the Board of Space Technology Laboratories in Inglewood, California. Lt General Donald L. Putt, USAF (Ret), who is President of the United Technology Corporation in Sunnyvale, California, succeeded Mr. Doolittle with Dr. Stever having been nominated for the post of Chairman as of 1 January 1962. Dr. von Karman has continued to serve with the Board since its inception, and is currently its Chairman Emeritus.

Compatible with its original charter, the Board remains established to provide advice to the USAF and now reports directly to the Secretary of the Air Force and to the Chief of Staff. From the existing Air Force Regulation 20-30, the functions and responsibilities of the Board are described as follows:

"...provides a close link with the scientific community of the Nation and brings to the Air Force the newest in scientific thought as it applies to the Air Force. It was created to strengthen and supplement, but not duplicate, the work of the Deputy Chief of Staff, Research and Technology, and the Air Force Systems Command, and all other echelons of the Air Force dealing with science and technology. Although its scope normally includes any scientific matter involved in fulfilling the Air Force mission, it also considers management problems that may affect the application of new scientific knowledge in carrying out that mission.

The function of the Board is solely advisory, and any determination of action to be taken with respect to matters upon which it advises or recommends is made solely by full time, salaried officers or employees of the Air Force. Specifically, the Board reports to the Secretary of the Air Force and to the Chief of Staff in performing the following advisory functions:

"a. Reviews and evaluates long-range plans for research and development, and provides advice on the adequacy of the Air Force program.

"b. Recommends unusually promising scientific developments for selective Air Force emphasis, and new scientific discoveries or techniques for practical application to weapon or support systems.

"c. Makes studies aimed at improving the effectiveness of the Air Force research and development program. These studies may involve the organization and management of the program; the adequacy of laboratory and testing facilities, of technical educational programs, or of current and projected technical personnel policies; the effectiveness of Air Force relations with civilian research institutions; and similar matters.

"d. Serves as a pool of expert advisors, either as individuals or in groups, to various Air Force activities. This service will be provided at the convenience of individual Board members."

Meetings of the entire Board are held at the call of the Chairman, normally twice a year. Panel and ad hoc committee meetings are held at the request of individual chairmen at times and places convenient to all concerned. Consultation services are also provided by members either singly or in groups smaller than panels or ad hoc committees on the same basis. It is noteworthy that many of the

members volunteer their services at no expense to the Air Force. Others receive a fee of approximately \$60 a day, during the periods they are employed which is minimal when compared with consulting fees they command from industry.

Since the days of the original Scientific Advisory Group, many significant accomplishments have accrued via the Board's efforts. The majority of this effort has been security-wise classified. One very important classified report by the Board's Nuclear Panel led to warhead techniques making our ICBM and ICBM programs a realistic and practical venture. In the unclassified area, a committee under the late Dr. Louis N. Ridenour prepared a report in 1949 on Research and Development in the U. S. Air Force containing recommendations that led to the creation of the Air Research and Development Command and to the Office of the Deputy Chief of Staff, Development (now the Office of the Deputy Chief of Staff, Research and Technology) in the Air Staff.

A sequel to the Ridenour report was developed and submitted by a Committee in 1958 under the chairmanship of Dr. Stever. This report, entitled "Research and Development in the Air Force", was of great assistance to the Air Research and Development Command in its modernization in 1959, and in turn the evolution of the present organization, the Air Force Systems Command. Other important events included findings that led to the formulation of the current USAF Air Defense Program. Under the direction of Dr. George E. Valley, Jr. of the Massachusetts Institute of Technology, now Chairman of the Board's Basic Research Panel, activities of an Air Defense Systems Engineering Committee were commenced shortly after the first Soviet atomic bomb was detonated. The work of Dr. Valley and others in this area led to the formation of the MIT Lincoln Laboratory. A still further significant product of the Board's deliberations was the establishment of the Arnold Engineering Development Center at Tullahoma, Tennessee designed to explore and seek solutions to the most advanced aerospace supersonic and hypersonic flight problems of aircraft, missiles, spacecraft and propulsion systems.



In the current vein of aerospace endeavor the Scientific Advisory Board has undertaken many interesting and vital studies and has provided advice and recommendations regarding them to the Secretary of the Air Force and to the Chief of Staff. Among these have been a study in the limited war area and counterinsurgency activities embracing current or foreseen needs for conducting applicable operations successfully. Possible applications of technology to conflict short of all out warfare involving specialized transport aircraft, target seeking missiles and small and clean nuclear weapons for tactical purposes have been and are under careful study. Another area covered has been that of the vastly expanding growth of electronic systems required to support weapon systems, i.e.-world-wide communications for the Strategic Air Command, global weather surveillance systems, and others, with a view to bringing about improvements in management and operational capability. A study has also been undertaken and recommendations provided in the area of laminar flow control which included a review of the status of recent research in the control of air flow in the boundary layer of an aircraft in order to reduce drag as a possible means to facilitate the design of more economical transport aircraft.

Missile problems have been surveyed including estimates of future ballistic missile accuracies and judgment has been rendered on the degree of confidence that can be placed on such estimates. In the important area of propulsion, one of the Board's panels has undertaken a study of the national program for space and pointed up the special characteristics of propulsion devices required for military needs such as reliability, producibility and minimum costs. A striking comparison has been made of the aforementioned military needs with those for purely civilian purposes such as are being pursued by the National Aeronautics and Space Administration. Regarding the area of future nuclear weapon technology, the Board's Nuclear Panel and associated ad hoc committees have provided estimates of the degree of improved nuclear weapon performance that can be expected either with or without a test moratorium, and the degree

of reliance that can be placed on such weapons. In addition, numerous advanced nuclear concepts have been considered resulting in the submission of specific recommendations.

Important findings and recommendations have been made and investigations are continuing by the Board's Life Sciences/Human Factors Panel in the area of manned space flight. This effort is applicable to both military and civilian needs. Companion investigations have also been carried out and are continuing in the area of advanced guidance and control equipment and techniques, and an exhaustive investigation has been made of space environmental conditions in which military operations have already occurred and are destined to expand. Studies are under way bearing on policy and utilization of scientific talent and the accompanying facilities needed to insure the desired rate of progress. Still another interesting effort is being pursued by the Board embracing an examination of the country's future strategic force complex. This is being carried out on the basis of a critical investigation of the current strategic posture and that which should prevail several years hence. Transitional steps that should be taken in terms of the best weapon systems mix, together with associated operational considerations, are being given special attention. An additional important area undergoing examination is that of relevant facets of arms control.

The current and future challenge in terms of aerospace power is magnitudes greater than it was in the instance of air power in 1944 when General Arnold first brought into being the organization that is now the USAF Scientific Advisory Board. It is an indisputable fact that aerospace power is destined to play an ever increasing role of importance on a world-wide basis, and it is now beginning to truly extend out into space. The increased emphasis that has been and must continue to be given to advanced aircraft, to missiles and to the realization of a fully functional and complete military space capability is therefore far more than simply a statistically interesting budgetary or news item. Instead it is a gravely serious matter on which the survival of this country and indeed mankind may very well rest.

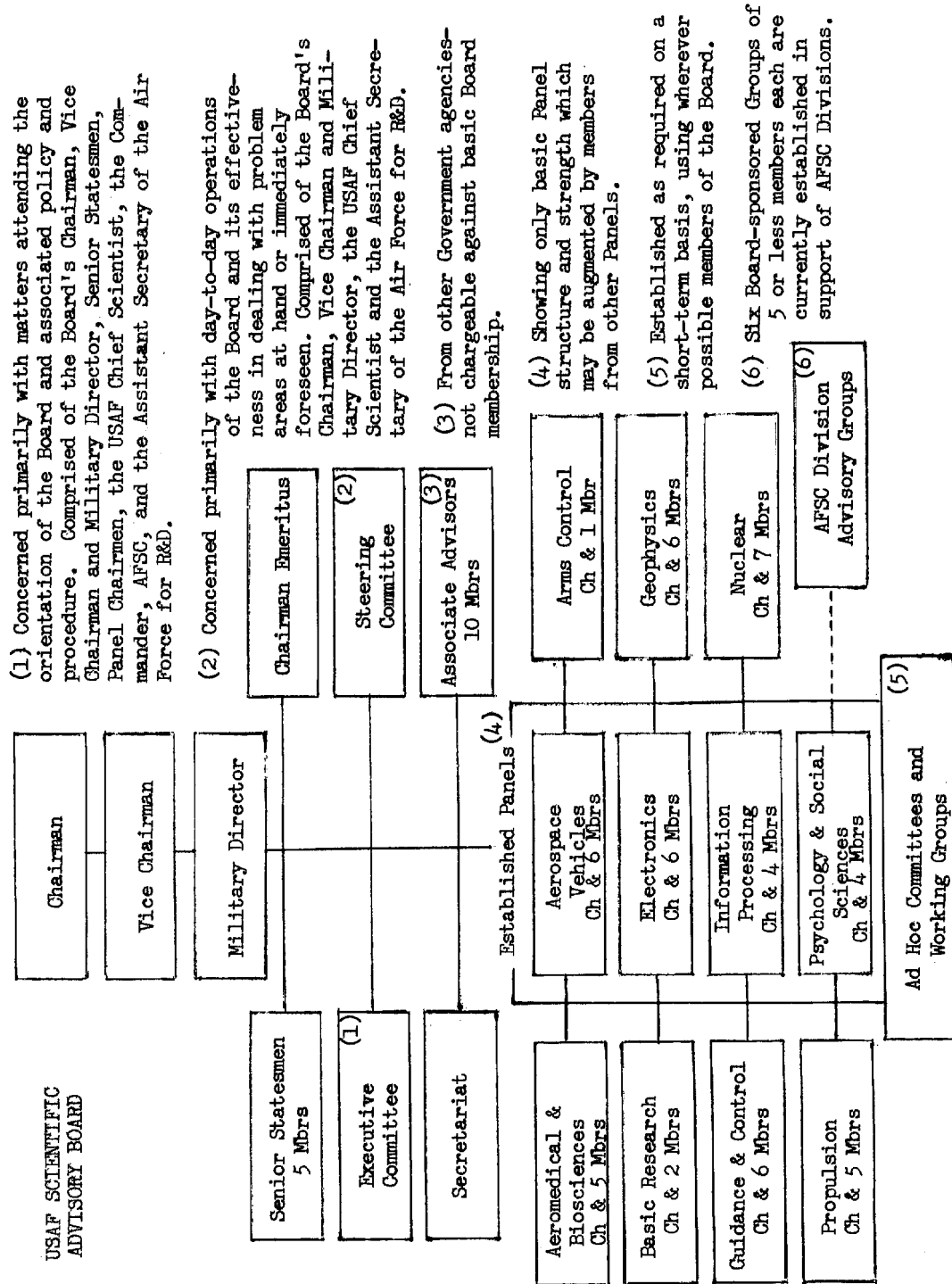
Together with other elements of the total military organization of the United States, aerospace power is by national policy established to function within the framework of deterrence. This policy embraces many facets, however, primarily it reflects clearly the need for an adequate force structure and defensive/offensive means with which to resist an initial major attack by hostile aircraft, missiles or from spacecraft and retain sufficient strength to retaliate effectively (and conclusively). The same policy applies under circumstances of limited conflict embracing small wars (of the scope and nature of action in Korea) extending downward to relatively minor counterinsurgency actions. Strategy, tactics, manpower and equipment must be adaptable to provide an effective response to the peculiarities of any threat.

Those who have an intimate understanding of the spectrum of modern warfare and who are aware of the present and forecast threat also know that from now on there must without fail be included a full and unequivocal measure of science and technology in every decision and action affecting war plans and associated tactics, strategy and war materiel. Every segment of military operations is affected and, within the role and mission of aerospace capability falling under their jurisdiction, both the Secretary of the Air Force and the Chief of Staff are intimately aware of all relevant implications. It has been and remains a basic policy of the Secretary and the Chief of Staff that a continuous and intimate military-scientist team effort is fundamental and vital to insuring aerospace superiority, and the strength that it adds to the overall posture of the nation.

Under its currently established Terms of Reference of reporting directly to the Secretary of the Air Force and to the Chief of Staff, the Scientific Advisory Board occupies a unique and extremely important position in being able to provide new and advanced scientific thought at all echelons of the Air Force. Through the medium of its currently established eleven panels and via ad hoc committees and advisory groups, or through advisory services provided by individual specialists, it responds

promptly and effectively to all problems posed to it. The Board also on its own volition identifies problem areas and proposes investigative actions in aid of still further enhancing through appropriate recommendations, the total capability of the Air Force. These services are furnished on a wholly voluntary basis by the Board's members and, in so doing, they not only bring extensive credit on themselves, but more importantly, provide advice and guidance of inestimable and lasting value on behalf of the welfare of the United States.

C.D.G.



*A. D. Wheeler*  
*1/17/61*

A RESUME OF  
THE HISTORY AND THE MISSION  
OF THE UNITED STATES AIR FORCE  
CHIEF OF STAFF'S  
SCIENTIFIC ADVISORY BOARD



1 January 1961

A RESUME OF  
THE HISTORY AND THE MISSION  
OF THE UNITED STATES AIR FORCE  
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SCIENTIFIC ADVISORY BOARD

## INTRODUCTION

Requests have been received from many quarters for information on the origin, evolution and current role of the USAF Scientific Advisory Board. A similar need is also apparent when new members and consultants join the Board in aid of their general familiarization with the Board's background and present terms of reference.

Because of these needs, and in keeping with a request by the Chairman of the Board, Lt. General D. L. Putt, USAF, (Ret), the Secretariat staff has prepared the following résumé of the Board's origin and its past and present mission.

It is to be appreciated that only selected highlights are recorded in this document. Such additional information as is desired, and is releaseable, may be had by contacting the Scientific Advisory Board Secretariat.



CLYDE D. GASSER  
Colonel, USAF  
Secretary, SAB



THE MISSION OF THE USAF CHIEF OF STAFF'S  
SCIENTIFIC ADVISORY BOARD

In 1944, General H. H. Arnold, then Commanding General of the Army Air Forces, formed the Army Air Forces Scientific Advisory Group, a body of scientists from industry, universities and research foundations under the personal supervision of Dr. Theodore von Karman to help the Air Force form its technological future.

This step was taken by General Arnold as a result of his reflections on accomplishments and shortcomings in air power up to that time in the conduct of World War II. Among the many things that he was deeply concerned with were significant warborne scientific advancements and accomplishments in foreign countries including radar in England, the realization of jet propulsion engines for aircraft application in both England and Germany, and the creation and operational employment of the V-1 and V-2 by Germany. It was clear to General Arnold that this country devoted attention primarily to engineering and production matters with consequent neglect of advanced scientific ideas on which the future must be based.

Because of these convictions, General Arnold asked Dr. von Karman and the Scientific Advisory Group to look at the horizon of science to insure qualitative superiority for future American air power. General Arnold explicitly requested that the state-of-the-art in existence at the time should be used only as a point of departure. Under this charge Dr. von Karman and approximately 35 key scientists developed findings that led to the publishing of a series of documents which proved very important to the Air Force. The first of these was a single volume entitled "Where We Stand." This was followed by a series of volumes entitled "Toward New Horizons" and, subsequently, a summary volume was released under the title of "Science - The Key to Air Supremacy." The impact of these documents on the Air Force was far-reaching and did much towards bringing to light future scientific-technological opportunities in terms of air power capabilities to come.

General Arnold was neither the first nor the only person concerned with air power who had applied scientific-technological advancements to that area. General Vandenberg and General Billy Mitchell were indeed others. It is, however, true that General Arnold was the first person in military aviation effectively to bring to bear the organized services of leading members of the American scientific community that so successfully and markedly set the stage for modern aerospace power in this country.

The original AAF Scientific Advisory Group has since emerged into the present Scientific Advisory Board which has on its rolls 75 members and 70 consultants. The current Chairman of the Board is Donald L. Putt, Lt General, USAF (Ret) who is also President of the United Technology Corporation located at Sunnyvale, California. The Vice Chairman of the Board is Dr. H. Guyford Stever of Massachusetts Institute of Technology, and the Military Director of the Board is Lt General Roscoe C. Wilson who also occupies the post of Deputy Chief of Staff, Development on the Air Staff. The original chairman of the Board, then the Scientific Advisory Group, Dr. Theodore von Karman, was followed by Dr. Mervin J. Kelly of Bell Telephone Laboratories. Dr. Kelly in turn was succeeded by Mr. James H. Doolittle now President of Space Technology Laboratories in Inglewood, California, with General Putt having taken over chairmanship in November 1958.

Quite compatible with its original charter, the Board remains established to provide advice to the Chief of Staff of the Air Force. From the existing Air Force Regulation 20-30, the functions and responsibilities of the Board are described as follows:

"It will provide a close link between the Air Force and the civilian scientific community of the Nation and will strengthen and supplement but not duplicate the activities of other Air Force staff and command research and development activities. The Board will report and present its recommendations directly to the Chief of Staff and its activities will normally include all scientific matters related to fulfilling

the Air Force mission. It will also include consideration of management and administrative problems that influence the effectiveness with which scientific knowledge is applied in carrying out the Air Force mission. Specifically in conducting its work the Board will:

a. Review and evaluate long-range plans for research and development, and advise the Chief of Staff of the adequacy of the Air Force program;

b. Recommend the placing of selective emphasis on unusually promising scientific fields, and making practical application of new scientific discoveries or techniques to weapon or support systems;

c. Make studies aimed at improving the effectiveness of the Air Force research and development program in such matters as the organization and management of the program, adequacy of laboratory and testing facilities, technical educational programs, current and projected technical personnel policies, and relations with civilian research institutions; and,

d. Serve as a pool of expert consultants to various Air Force activities, either as individuals or in groups. This will be done at the convenience of individual Board members."

In addition to regular members who are invited to join the Board by the Chief of Staff, as mentioned earlier, there also exists a number of consultants who are utilized to supplement deliberations of members within the various disciplines considered. These consultants are of the same scientific stature as the regular members. Meetings of the complete Board are held at the call of the Chairman of the Board, normally twice a year. Panel and ad hoc committee meetings are held at the request of individual chairmen at times and places convenient to all concerned. It is noteworthy that many of the members and consultants volunteer their services at no expense to the Air Force. Others receive a fee of \$50 a day, during the periods they are employed, which is extremely small when compared with consulting fees paid by industry.

Since the days of the original Arnold/von Karman team in 1944 and 1945 many significant accomplishments have accrued via the Board's efforts. The majority of this effort has been security-wise classified. One very important classified report by the Board's Nuclear Panel led to war-head techniques making our IRBM and ICBM programs a realistic and practical venture. In the unclassified area a committee under the late Dr. Louis N. Ridenour prepared a report in 1949 on Research and Development in the U.S. Air Force containing recommendations that led to the creation of the Air Research and Development Command and to the office of the Deputy Chief of Staff, Development in the Air Staff. A sequel to the aforementioned Ridenour report was developed and submitted by a Committee in 1958 under the chairmanship of Dr. Stever. The report "Research and Development in the Air Force" was of great assistance to the Air Research and Development Command in modernizing its organization in 1959.

Other significant events included committee findings that led to the formulation of the current USAF Air Defense Program. Under the direction of Dr. George Valley of MIT, now chairman of the Board's Basic Research Panel, activities of an Air Defense Systems Engineering Committee were commenced shortly after the first Soviet atomic bomb was detonated. The work of Dr. Valley and others in this area led to the formation of the MIT Lincoln Laboratory. A still further significant product of the Board's deliberations was the establishment of the Arnold Engineering Development Center at Tullahoma, Tennessee designed to deal with the most advanced aerospace supersonic and hypersonic flight problems of aircraft, missiles, space vehicles and propulsion systems.

In a more current vein, during the past 24 months the Scientific Advisory Board has undertaken many interesting and vital studies and has provided advice and recommendations regarding them to the Chief of Staff. Among these have been a study in the limited war area embracing current or foreseen needs for conducting limited war and possible applications of technology in these areas such as specialized transport aircraft, target seeking missiles, small and clean nuclear weapons for tactical purposes, and other ideas.

Another area covered was that of electronics. In this case an examination was made of the vastly expanding growth of electronic systems required to support weapon systems, i.e. - world-wide communications for SAC, global weather supporting systems, and others, with a view to bringing about improvements in management and operational capability. A study was also undertaken and recommendations provided in the area of boundary layer control which included a review of the status of recent research in the control of air flow in the "boundary layer" of an aircraft in order to reduce drag and as a possible means to facilitate the design of more economical transport aircraft.

Missile problems were surveyed including estimates of future ballistic missile accuracies and judgment was rendered on the degree of confidence that could be placed on such estimates. In the crucial area of propulsion, one of the Board's panels undertook the study of the national program for space and pointed up the special characteristics of propulsion devices required for military needs such as reliability, producibility and minimum costs. A striking comparison was made of the aforementioned military needs with those for purely civilian purposes such as are being pursued by NASA. Regarding the area of future nuclear weapon technology, the Board's Nuclear Panel deliberated in this area and provided estimates of the degree of improved nuclear weapon performance that could be expected with or without a test moratorium, and the degree of reliance that could be placed on untested weapons. There were many more.

The present and the future challenge in terms of aerospace power is magnitudes greater than it was in the instance of airpower in 1944 when General Arnold first brought into being the organization that is now the USAF Scientific Advisory Board. Aerospace power is and will constantly increase in its role as a salient ingredient in the struggle for supremacy and indeed existence of the free world. The increased emphasis being given to advanced aircraft and to missiles of all kinds and the current emergence of the space era are not merely statistically interesting but, instead, constitute a major element of the lifeblood of this country.

As Chief of the Air Force, General White has his full share of responsibilities within the role and mission of aerospace power falling under his jurisdiction. Together with other elements of the U. S. military organization, aerospace power is by national policy established to function within a deterrent atmosphere. General White's difficult problem, therefore, has many facets which include the need for an adequate defense to resist an initial attack by hostile aircraft, missiles and space vehicles and retain sufficient strength to retaliate effectively and, with other military forces, win. As was the case with his predecessors, General White is fully aware of the impact of science on aerospace power. He personally frequently discusses with members of his Scientific Advisory Board problems that face him and gives every encouragement to them to assist him.

Through the aforementioned consultation between General White and his Scientific Advisory Board, therefore, some of the most serious responsibilities resting on his shoulders are shared by the scientists of the Board, and their obligation as both scientists and citizens is consequently a great one. Looking at our current stand and possible technical achievements in the future, both General White and the members of the Board realize fully that only through the most intelligent and energetic prosecution of scientific endeavor and through the application of the products of such efforts can we hope to maintain a superior aerospace military posture.

